ЭФФЕКТИВНЫЕ ЦЕМЕНТНЫЕ КОМПОЗИТЫ, МОДИФИЦИРОВАННЫЕ ВОДОРАСТВОРИМЫМИ АДДУКТАМИ НАНОКЛАСТЕРОВ УГЛЕРОДА

Низина Татьяна Анатольевна
д.т.н., профессор кафедры строительных конструкций
(Архитектурно-строительный факультет
Национального исследовательского
Мордовского государственного университета, г. Саранск)

Компоненты исследуемых составов

Исследуемые факторы	Интервалы варьирования
Содержание пластификатора Melflux 1641 F, % от массы цемента	0,4 – 0,8
Содержание модификатора, % от массы пластификатора Melflux 1641 F	0 – 6
В/Ц отношение	0,27 – 0,31

Исследуемые модификаторы (ООО «НТЦ Прикладных Нанотехнологий», г. Санкт-Петербург):

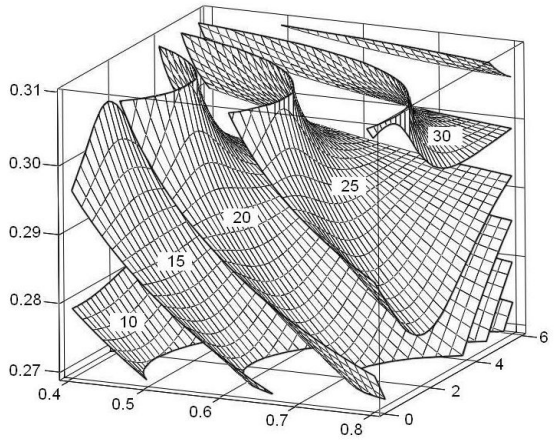
АНКУ 2, АНКУ 5, АНКУ 5А – сульфопроизводное нанокластера углерода;
АНКУ 6 – натриевая соль водорастворимого наноуглеродного аддукта;
НКУ – водорастворимый наноуглеродный аддукт.

Портландцемент ЦЕМ I 42,5Б (ОАО «Мордовцемент», р. Мордовия)

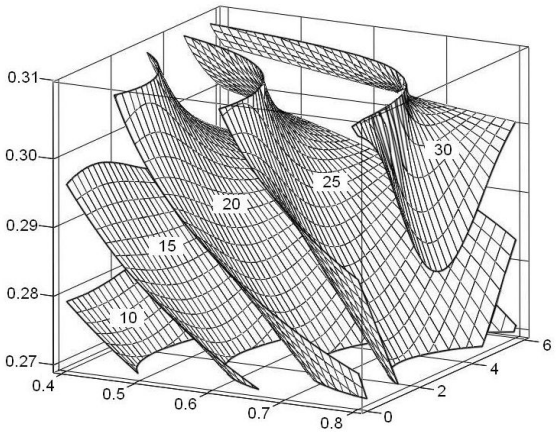
Пластификатор Melflux 1641 F (BASF Constraction Polymers, Trostberg, Германия)

Расплыв модифицированного цементного теста (см)

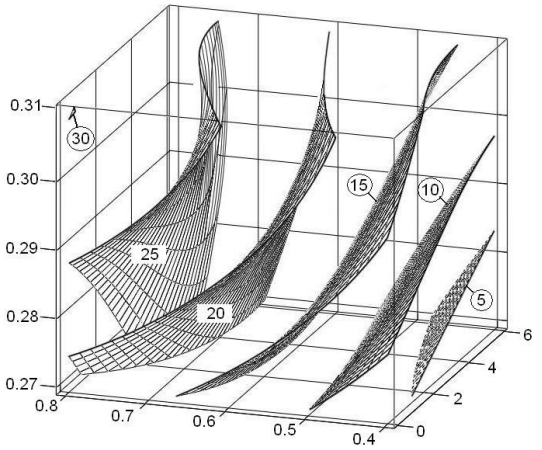
АНКУ 2



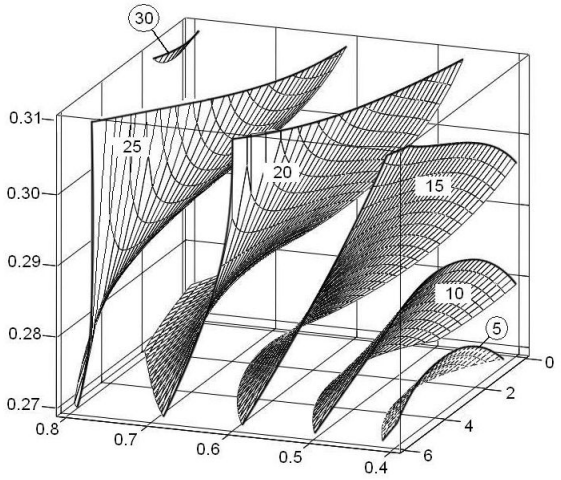
АНКУ 5



АНКУ 5А



АНКУ 6



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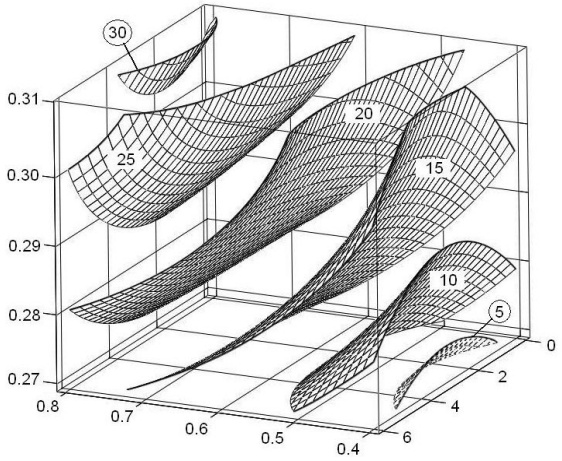
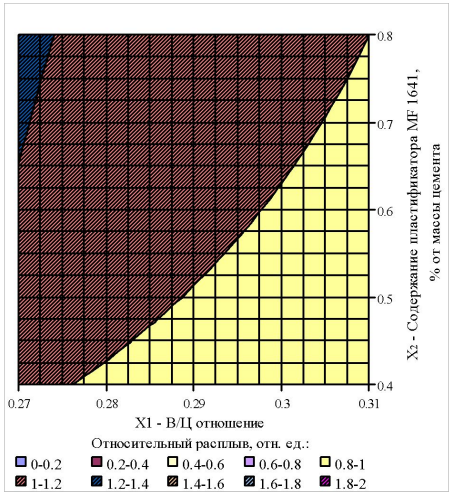
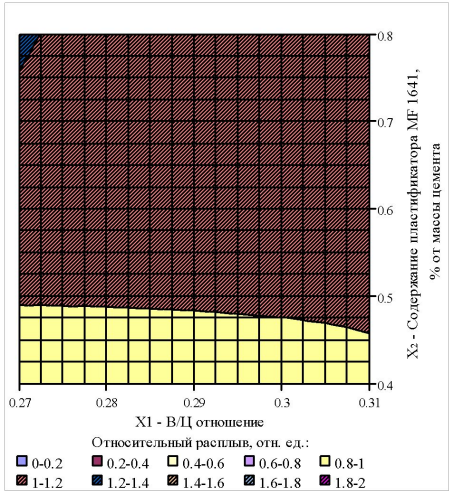
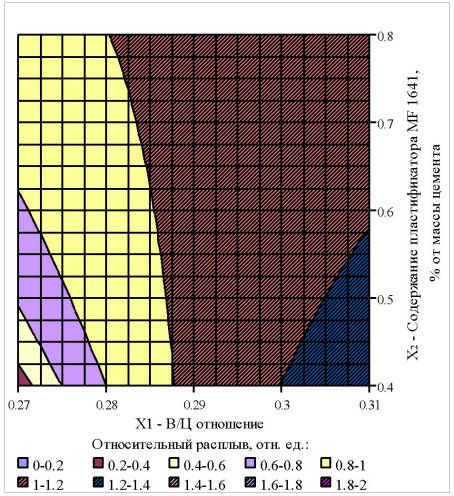


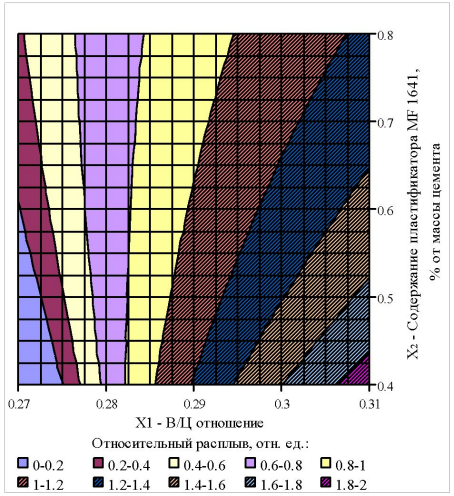
Относительный расплыв цементного теста

АНКУ 2: 1,5% 3% 4,5% 6%

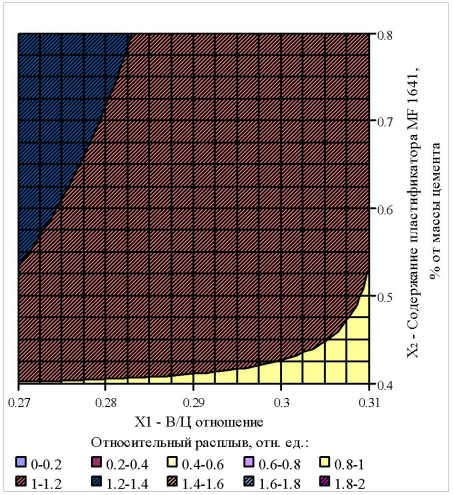


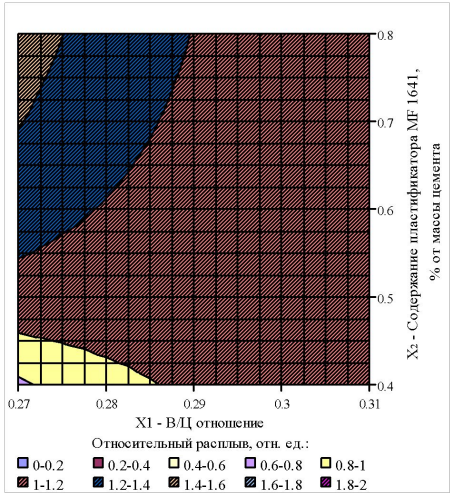


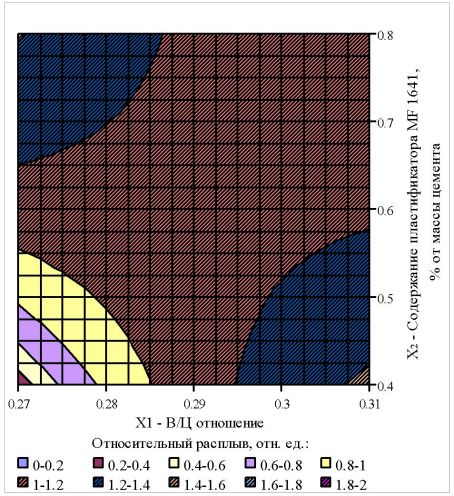


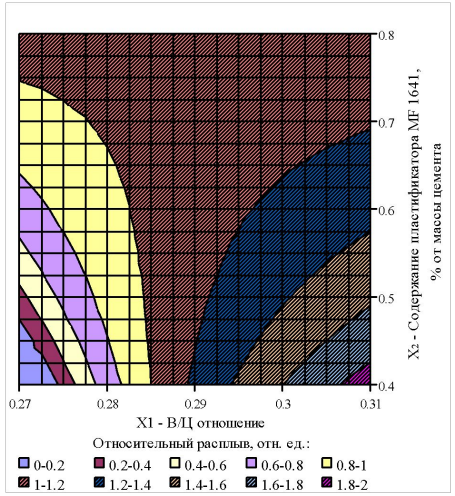


АНКУ 5: 1,5% 3% 4,5% 6%



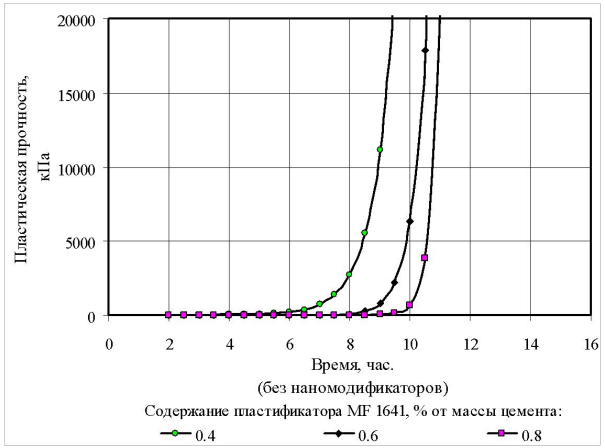




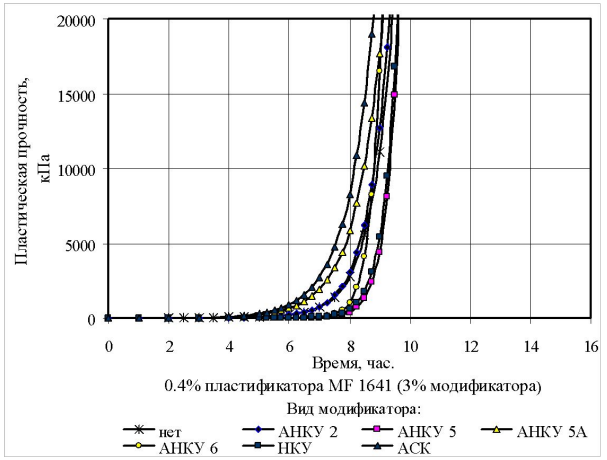


Кривые пластической прочности модифицированного цементного теста

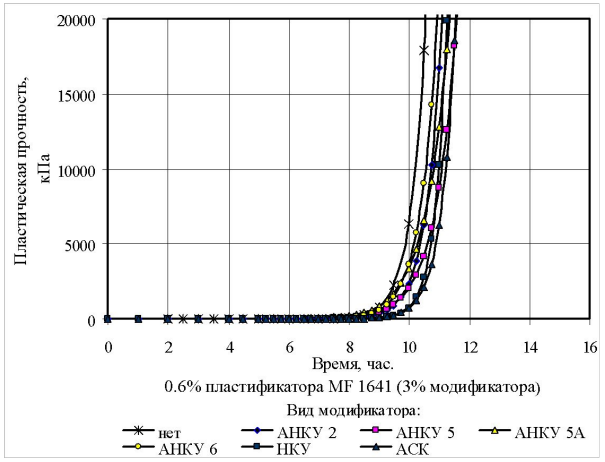
без модификатора



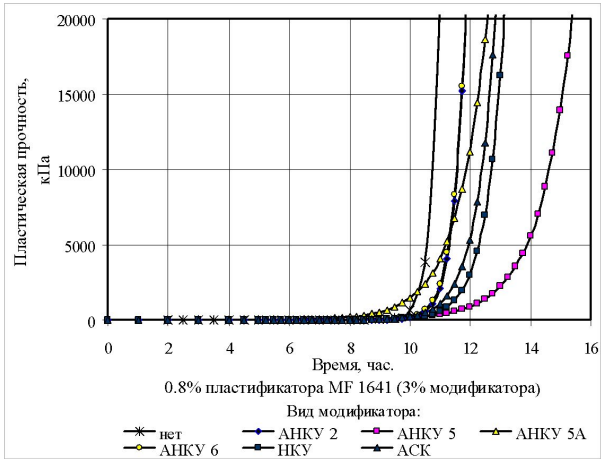
0.4% Melflux 1641 F



0.6% Melflux 1641 F

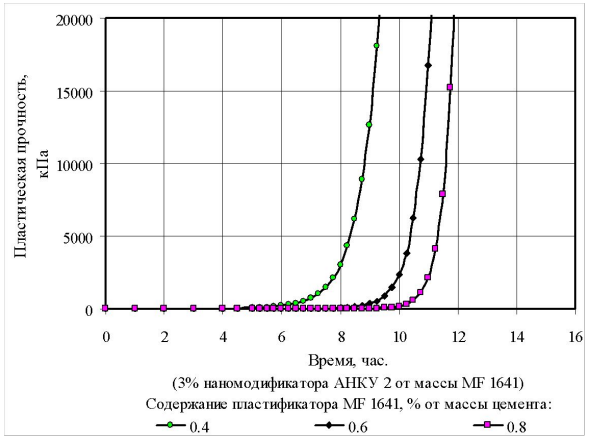


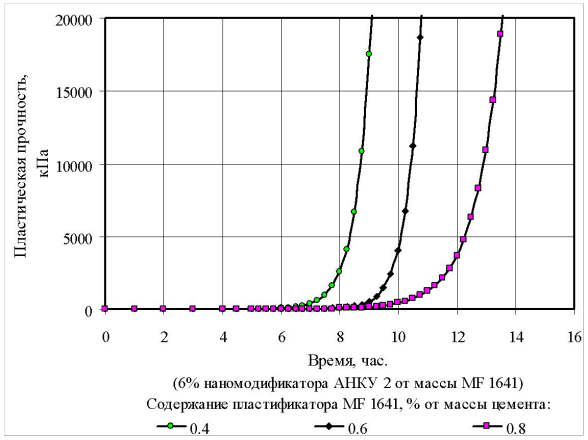
0.8% Melflux 1641 F



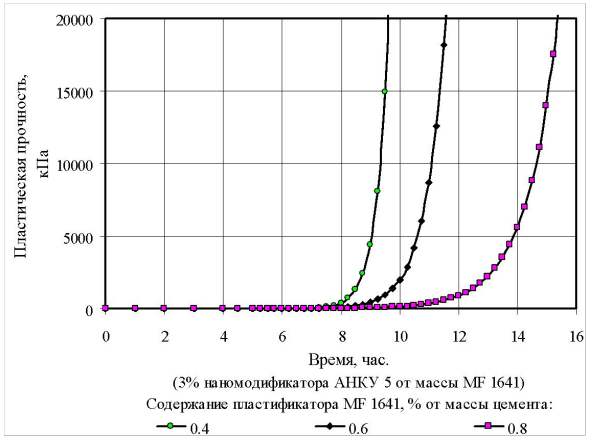
Кривые пластической прочности модифицированного цементного теста

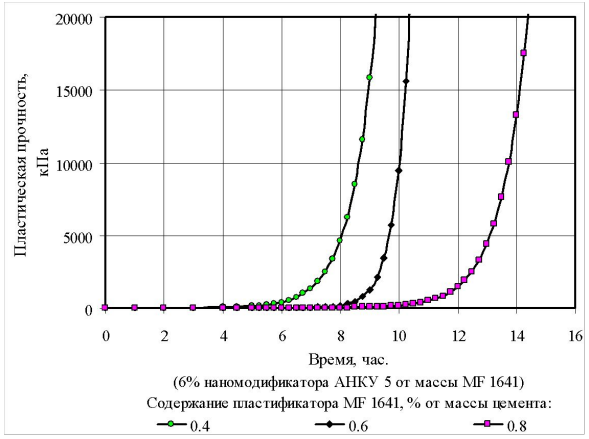
АНКУ 2



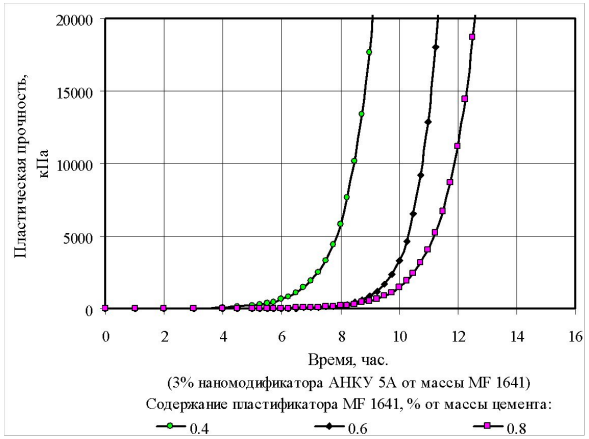


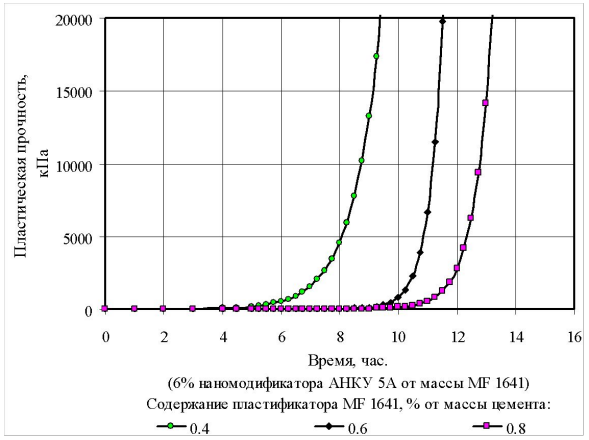
АНКУ 5





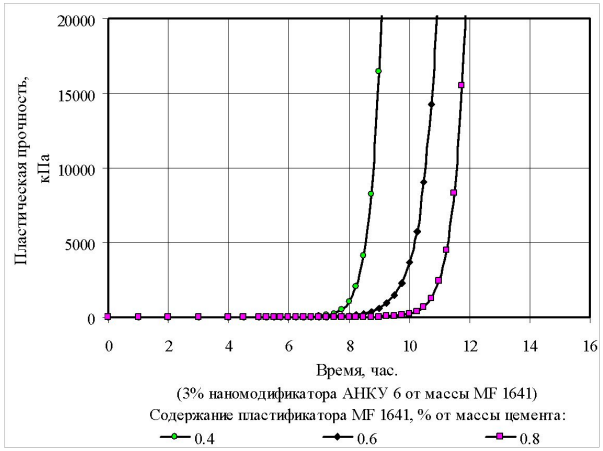
АНКУ 5А

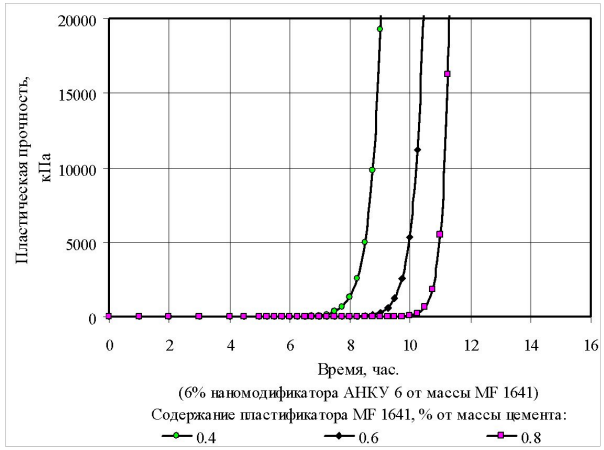




Кривые пластической прочности модифицированного цементного теста

НКУ 6





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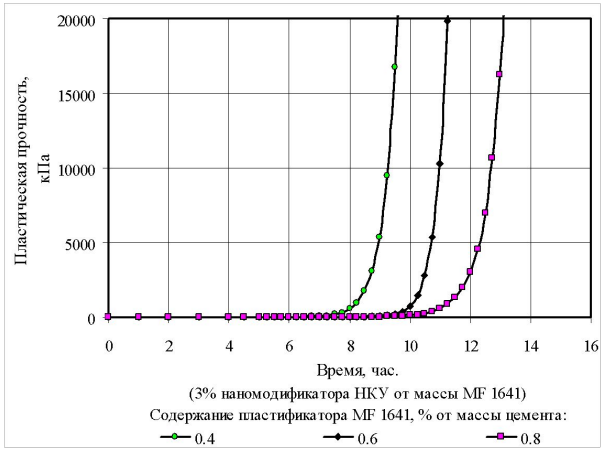
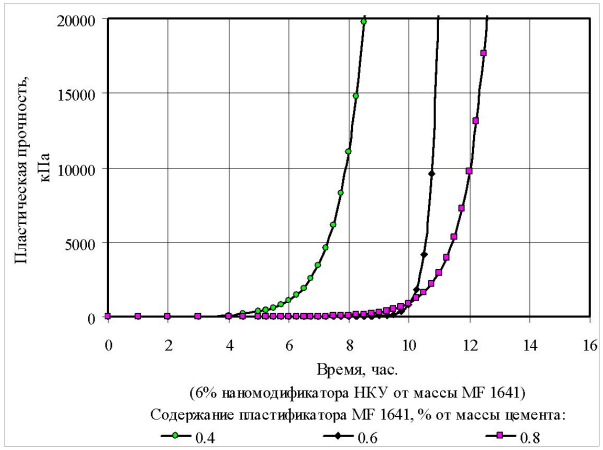
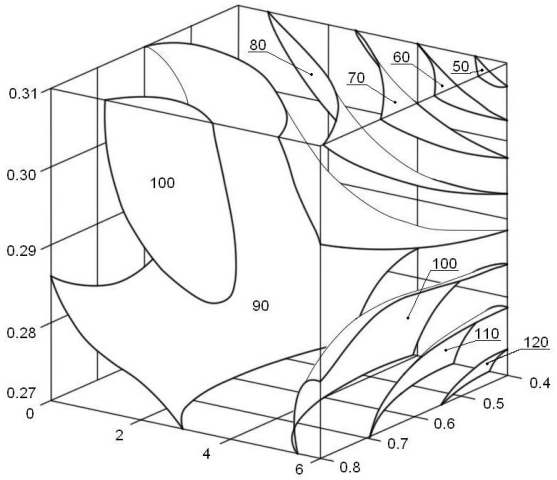




Предел прочности при сжатии (МПа) модифицированного цементного камня

АНКУ 2



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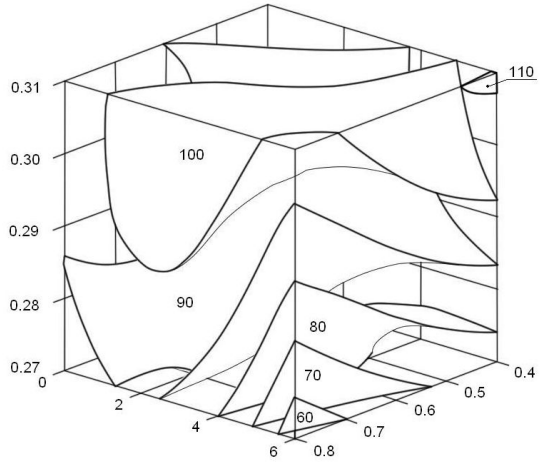

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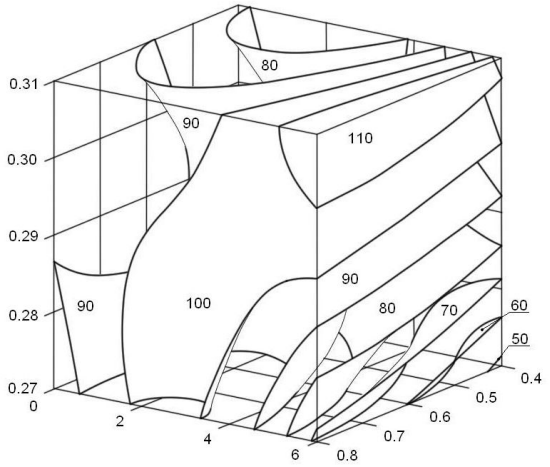

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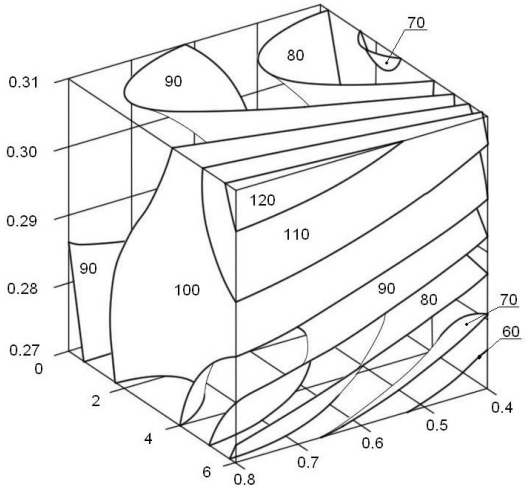

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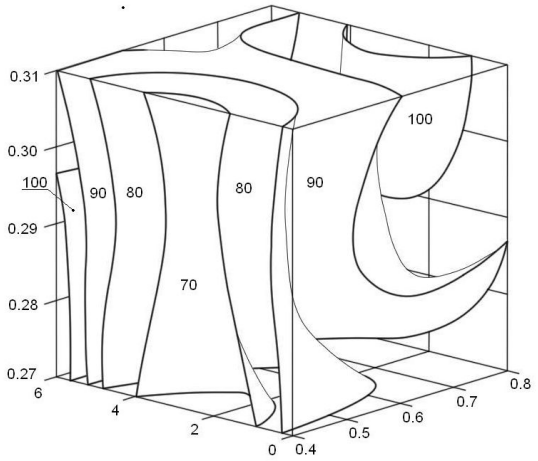
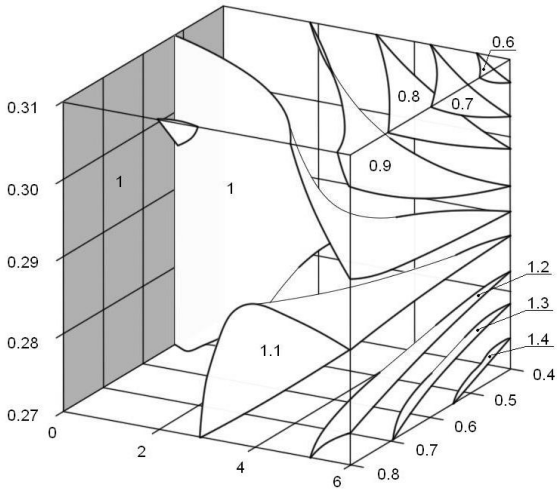


Относительный предел прочности при сжатии модифицированного цементного камня

АНКУ 2



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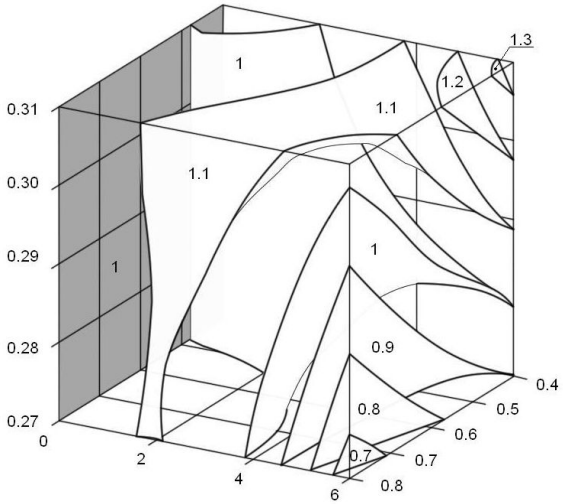

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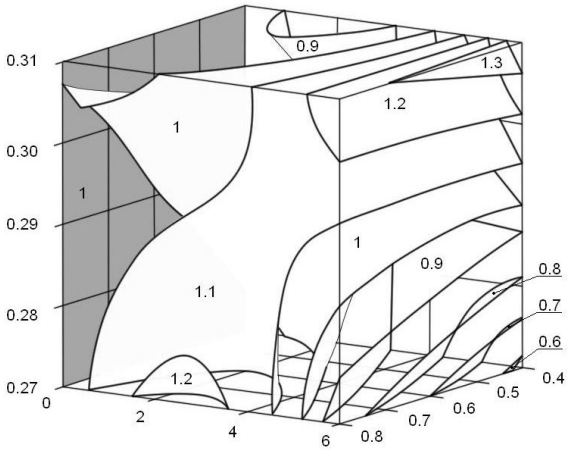
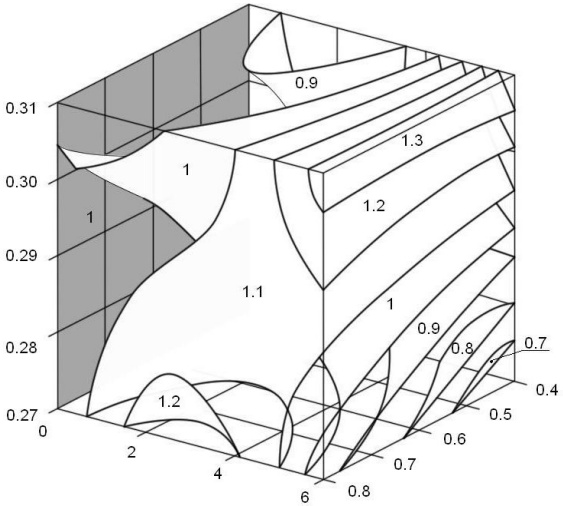


АНКУ 6



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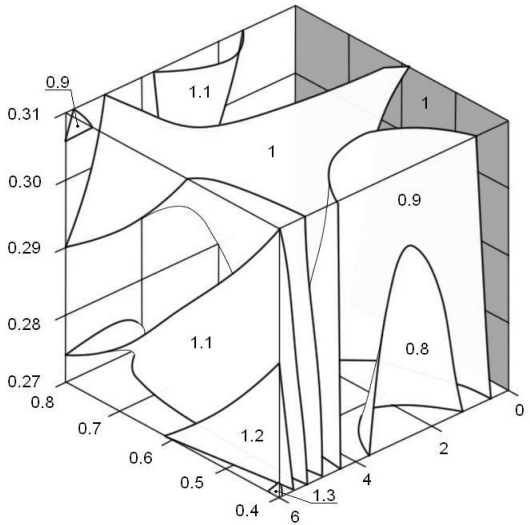
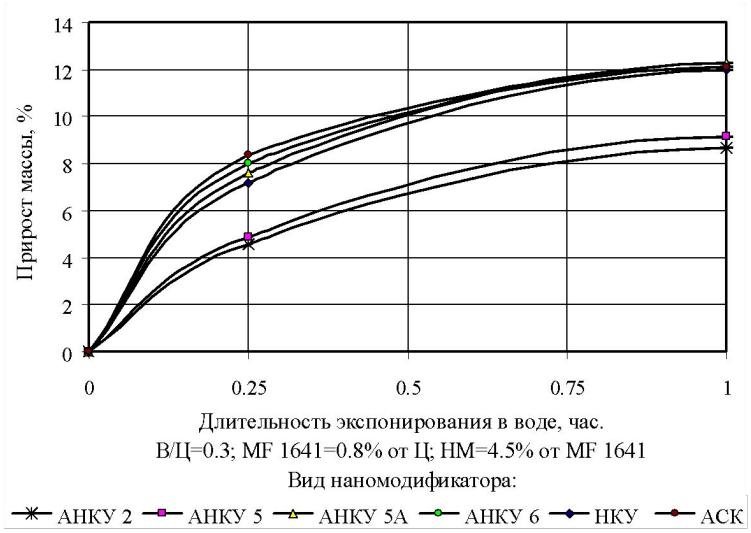
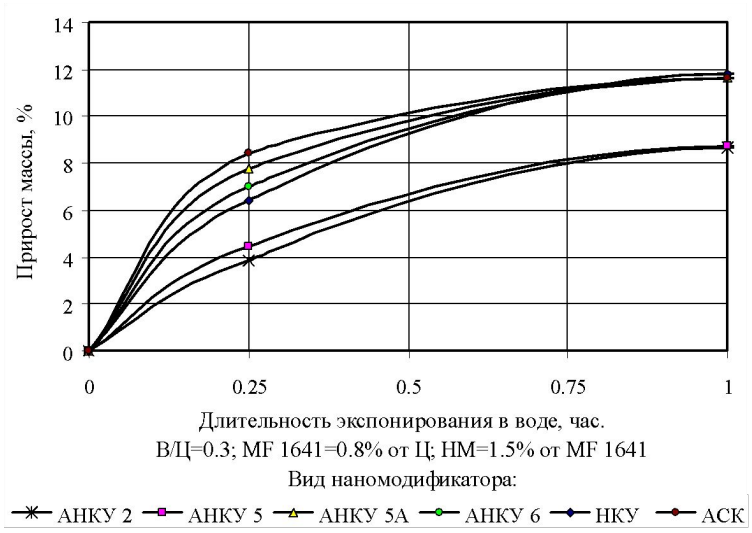
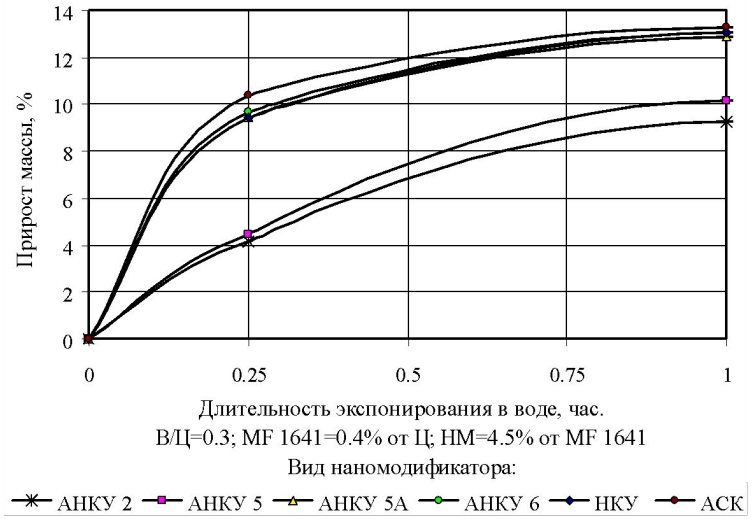
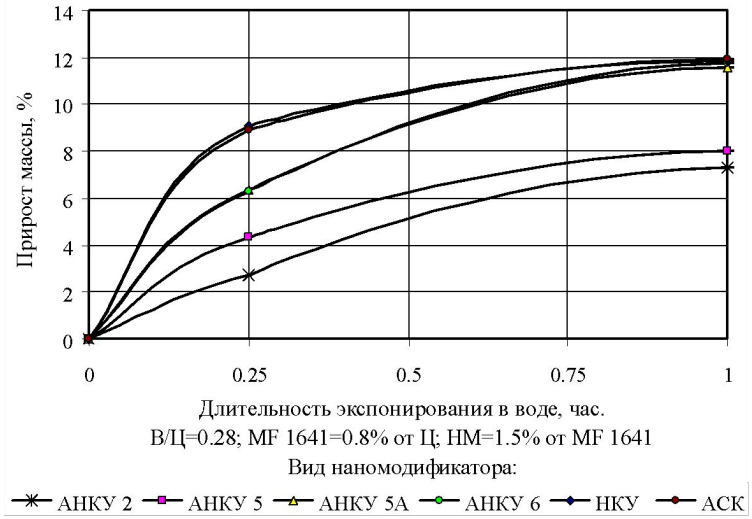


Сорбционные кривые модифицированного цементного камня при экспонировании в воде



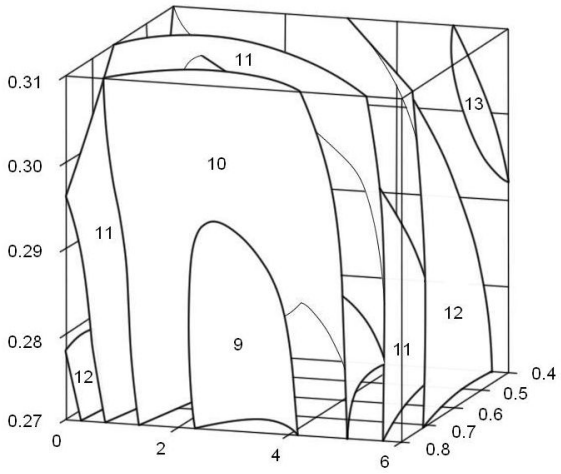




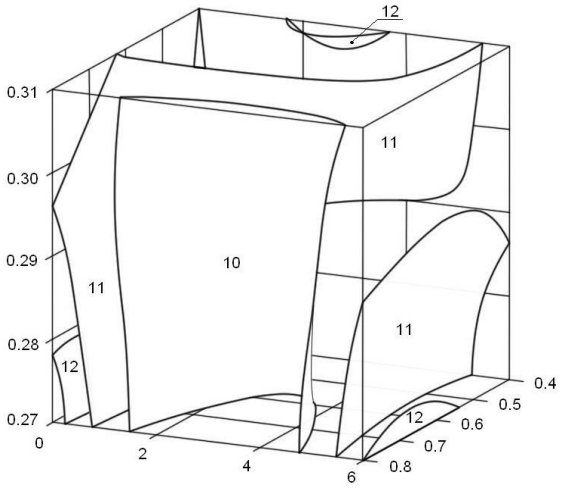


Относительный предел прочности при сжатии модифицированного цементного камня

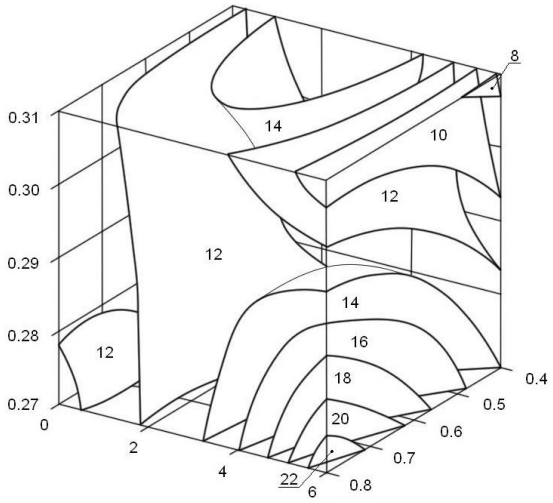
АНКУ 2



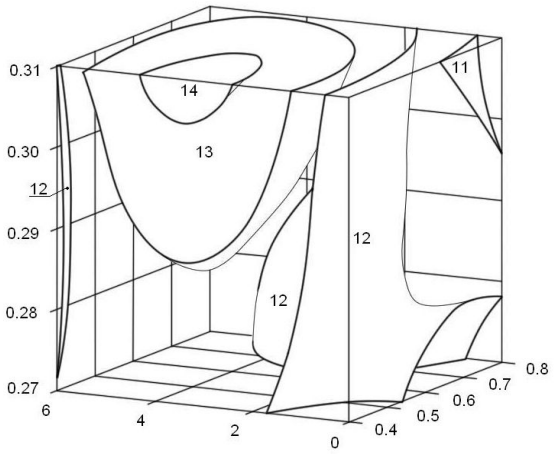
АНКУ 5



АНКУ 5А



АНКУ 6



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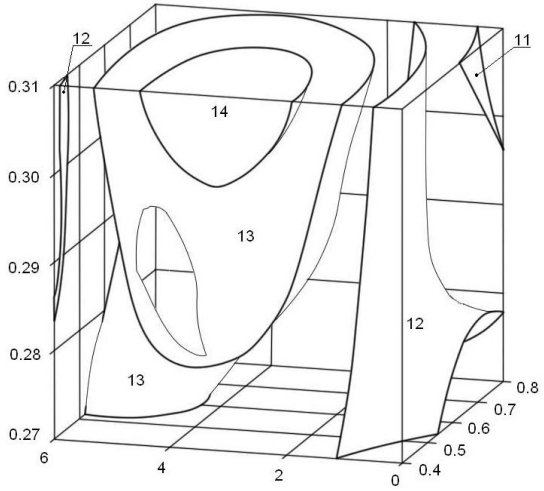
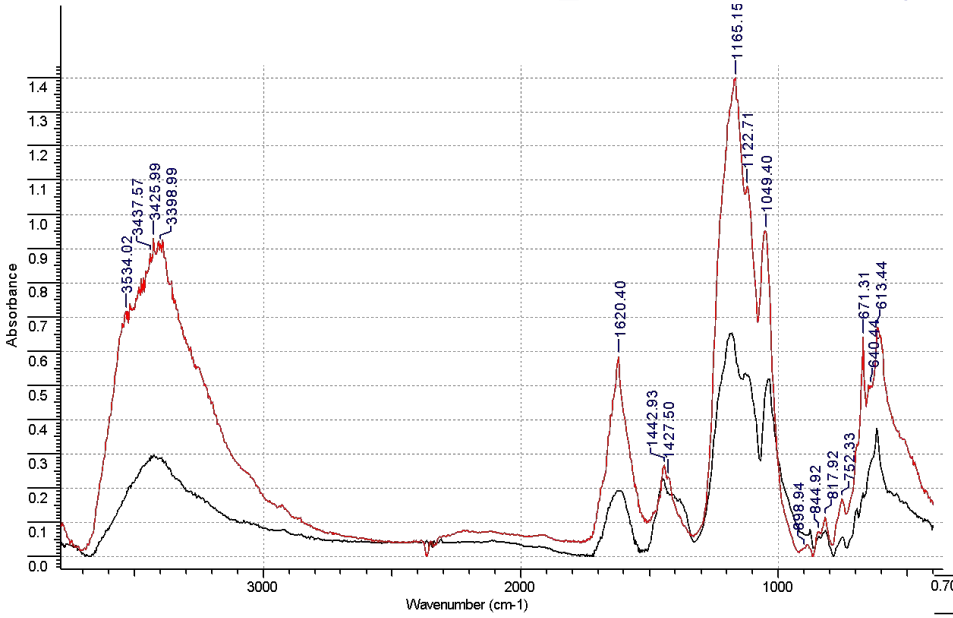
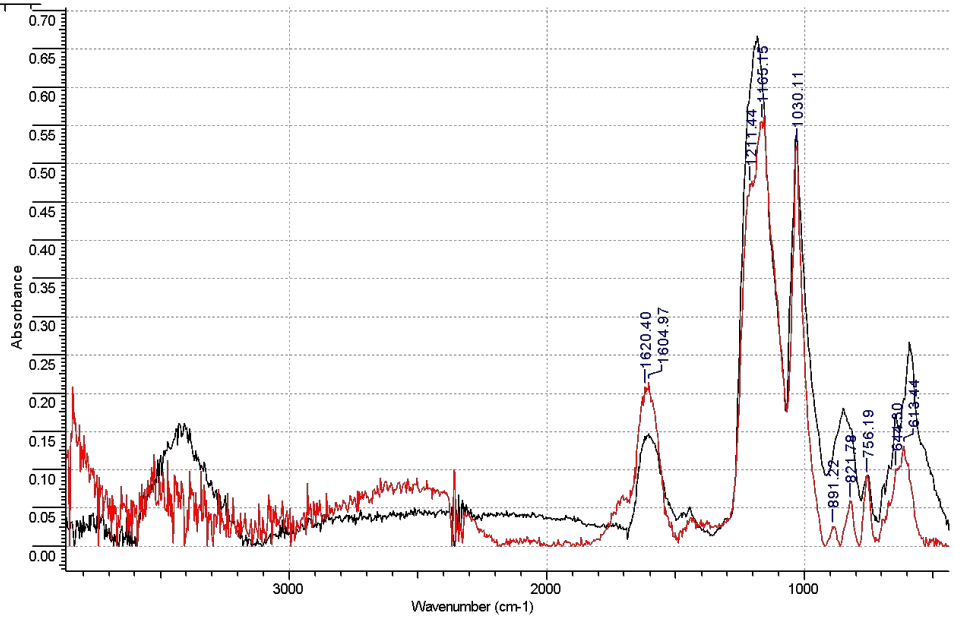


ИК-спектры исследуемых модификаторов



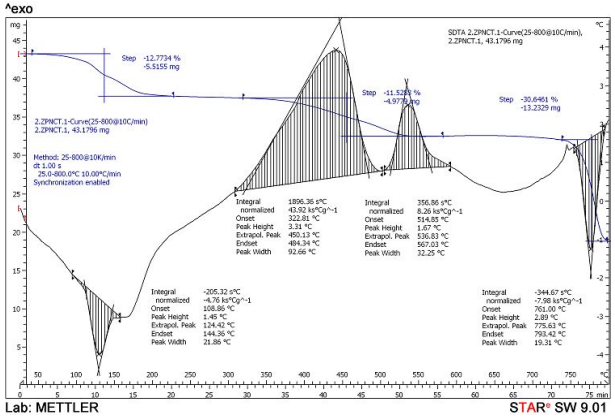
АНКУ 5 (красная линия);
АНКУ 5А (черная линия)

НКУ (красная линия);
АНКУ 6 (черная линия)

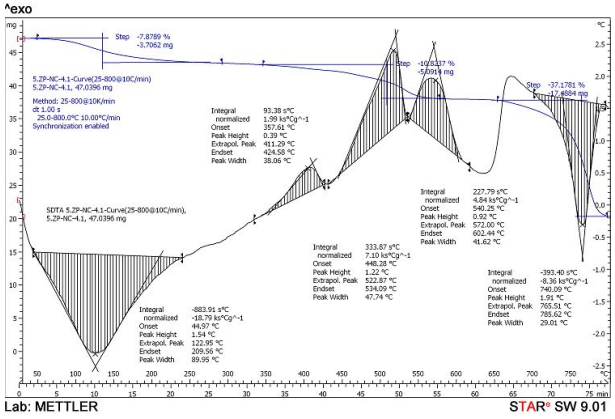


Результаты термогравиметрического анализа исследуемых модификаторов

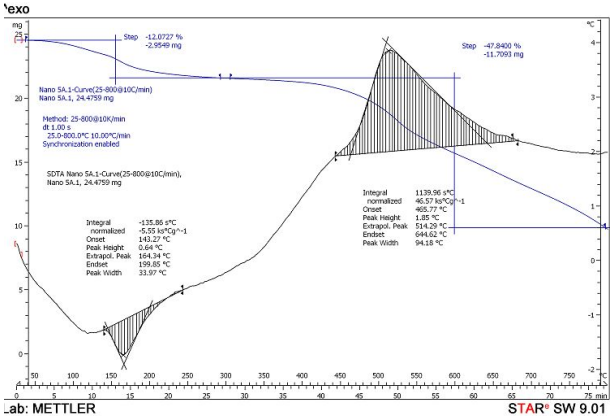
АНКУ 2



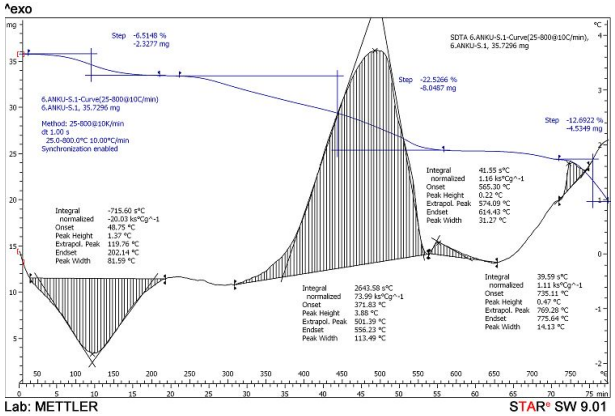
АНКУ 5



АНКУ 5А



АНКУ 6



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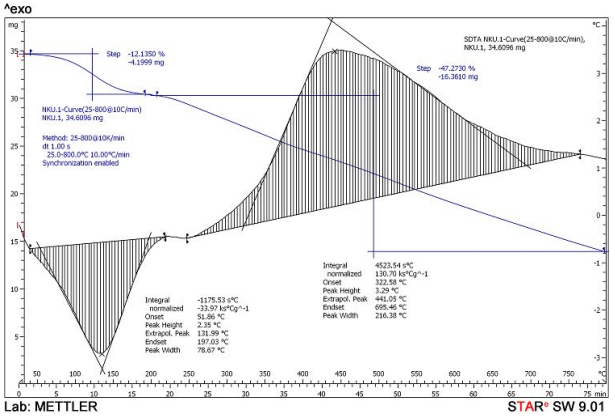
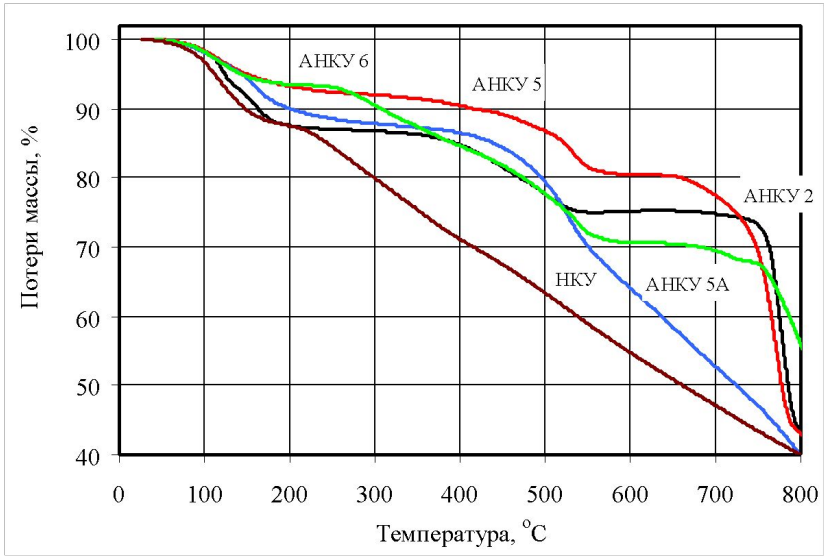
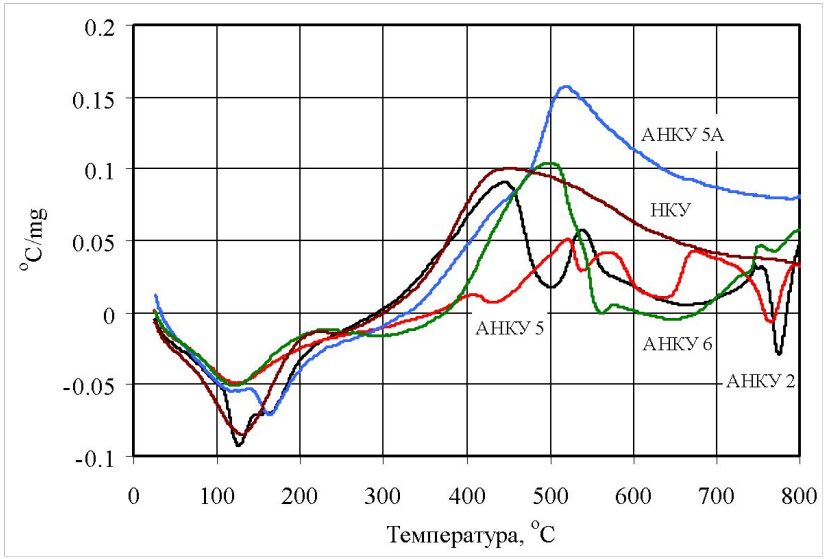
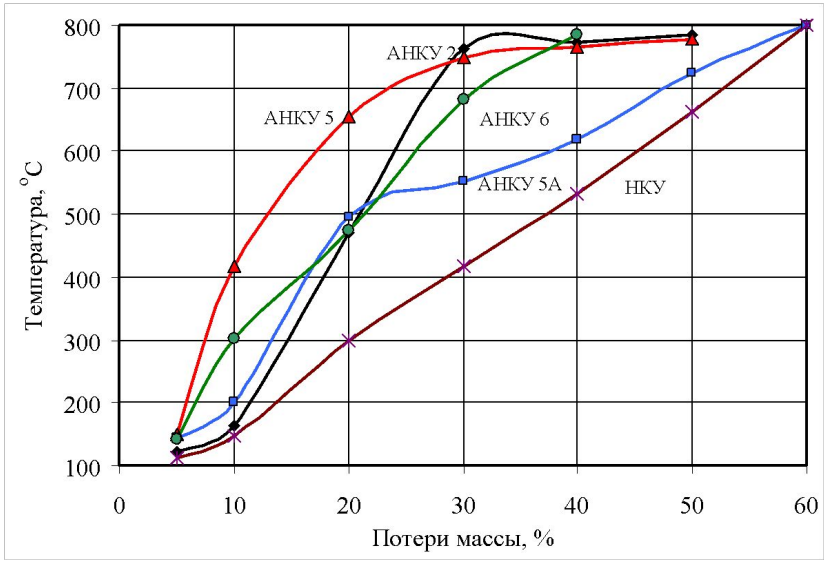
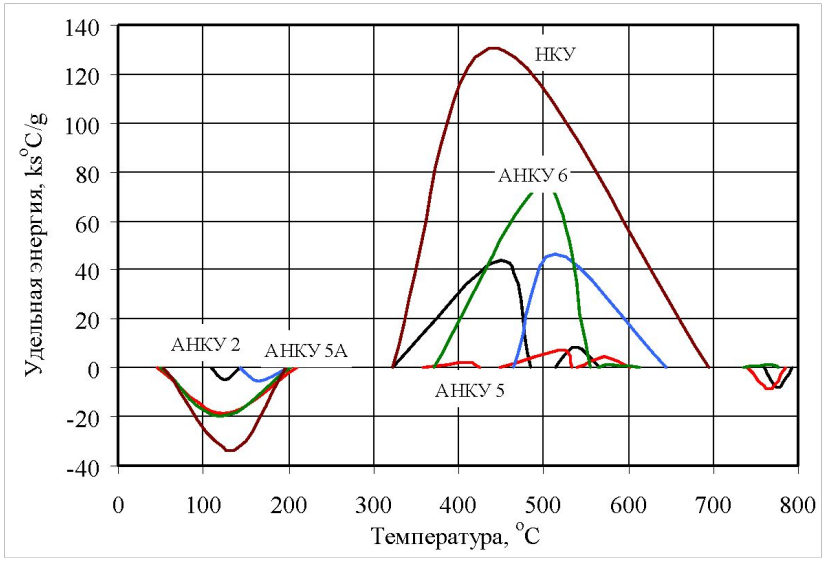


Результаты анализа термической стойкости порошков наномодификаторов





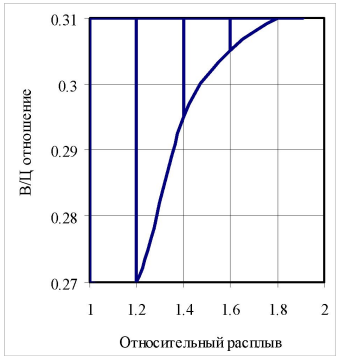


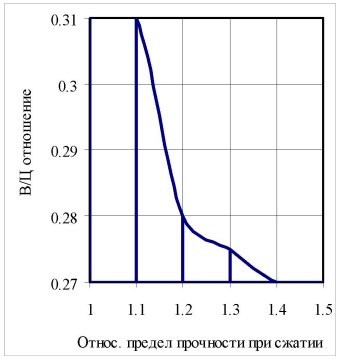


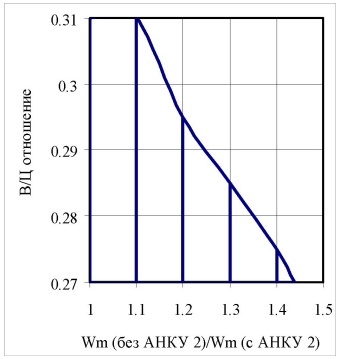
Оптимизация составов модифицированного АНКУ 2 цементного камня методом скаляризации

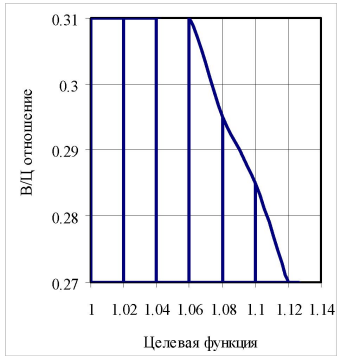
Максимум целевой функции:

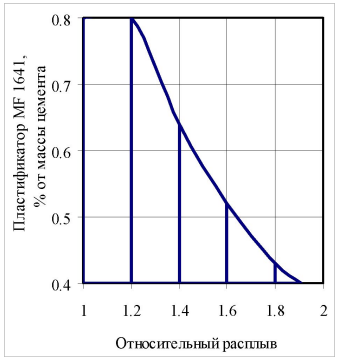
$$q(x_1, x_2, x_3) = \min\left\{\frac{P_{к(АНКУ)}}{P_{к(0)}}, \frac{R_{сж.(АНКУ)}}{R_{сж.(0)}}, \frac{W_{m(0)}}{W_{m(АНКУ)}}\right\}$$

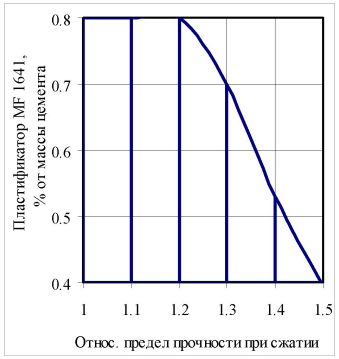


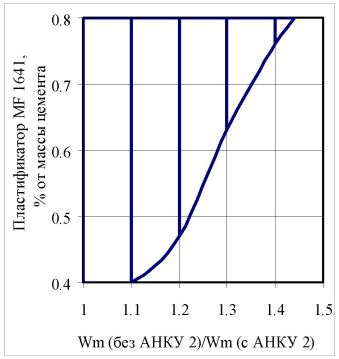


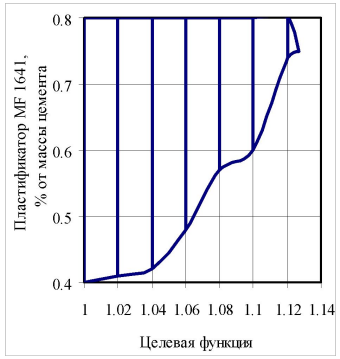


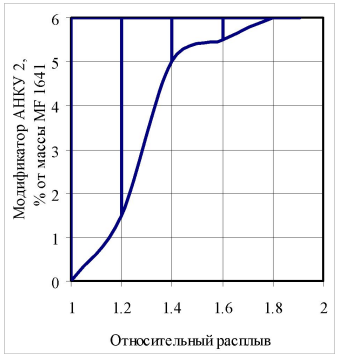


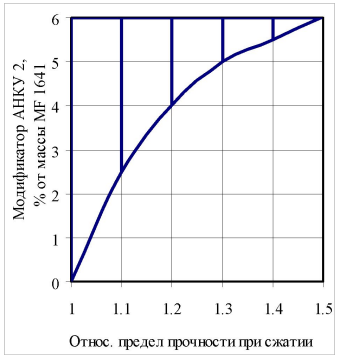


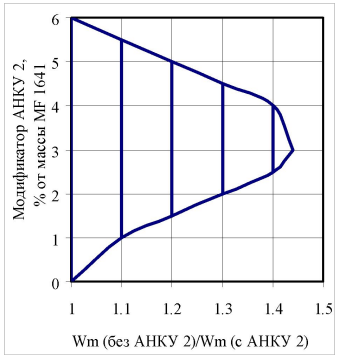


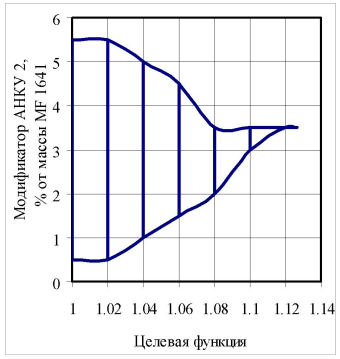






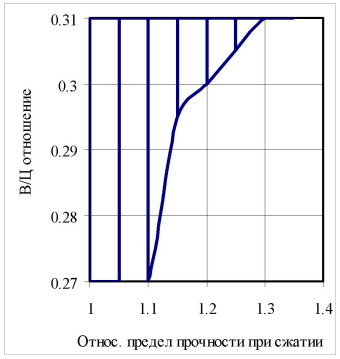


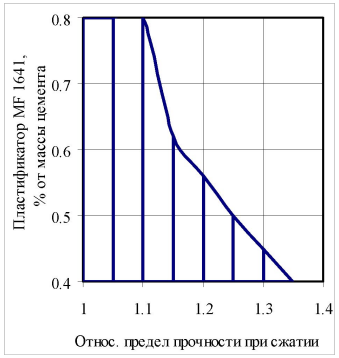


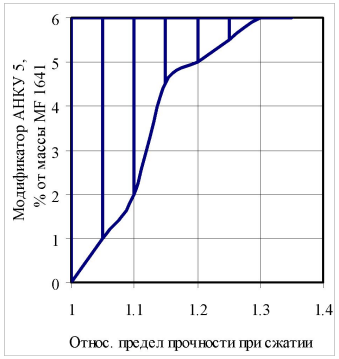


Оптимизация составов модифицированного цементного камня

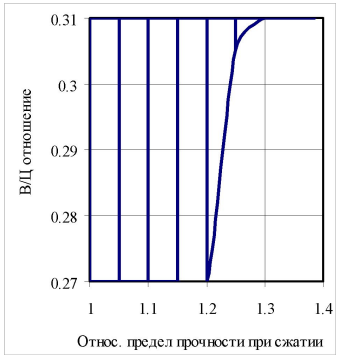
АНКУ 2

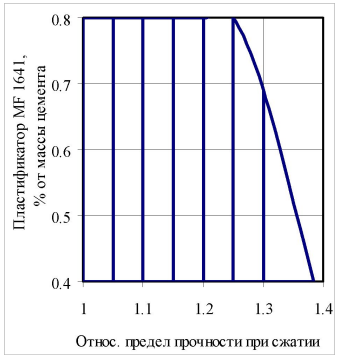


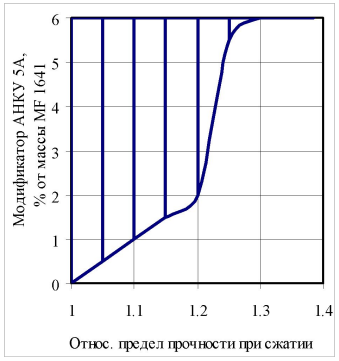




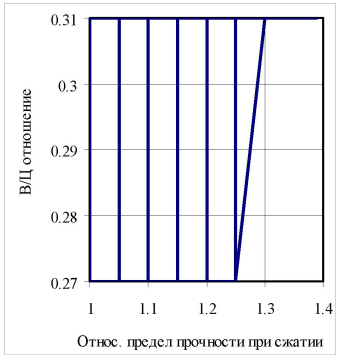
АНКУ 5

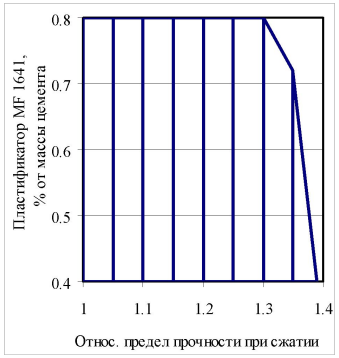


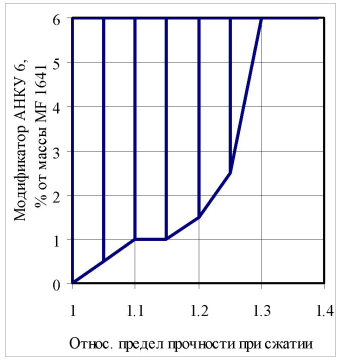




АНКУ 5А







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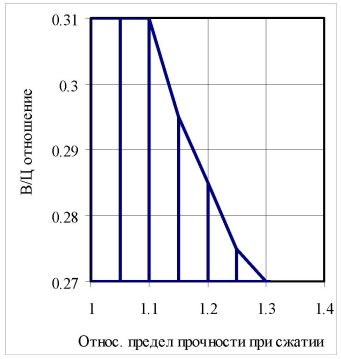

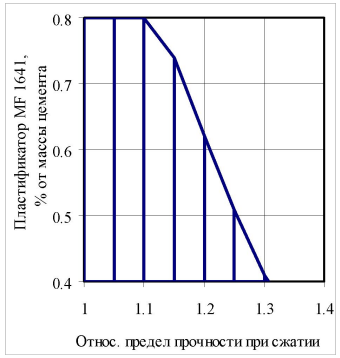

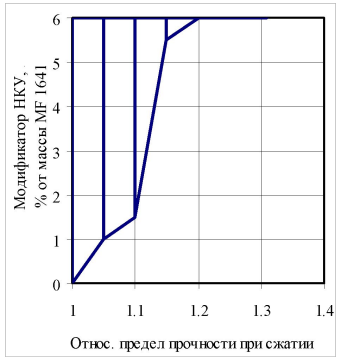

Спасибо за внимание!